(12) INTERNATIONAL [redacted]CATION PUBLISHED UNDER THE PATENT CO[redacted]ATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
23 August 2001 (23.08.2001)

PCT

(10) International Publication Number
WO 01/60163 A2

(51) International Patent Classification[7]: A01N 65/00, 61/00, 53/00 // (A01N 65/00, 65:00, 61:00) (A01N 61/00, 61:00) (A01N 53/00, 31:04)

(21) International Application Number: PCT/US01/04985

(22) International Filing Date: 16 February 2001 (16.02.2001)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
09/505,680 17 February 2000 (17.02.2000) US

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(81) Designated States *(national)*: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CR, CU, CZ, DE, DK, DM, DZ, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW.

(84) Designated States *(regional)*: ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).

Published:
— *without international search report and to be republished upon receipt of that report*

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

WO 01/60163 A2

(54) Title: PESTICIDAL COMPOSITIONS CONTAINING PLANT ESSENTIAL OILS AGAINST HUMAN BODY LOUSE

(57) Abstract: Pesticidal compositions for the control of human body louse containing one or more plant essential oils. In addition, the present invention is directed to a method for controlling human body louse by applying a pesticidally-effective amount of the above pesticidal compositions to a locus where pest control is desired.

PESTICIDAL COMPOSITIONS CONTAINING PLANT ESSENTIAL OILS AGAINST HUMAN BODY LOUSE

FIELD OF THE INVENTION

The present invention relates, in general, to pesticidal compositions containing plant essential oils against human body louse, including head lice, body lice, and pubic lice. In one aspect, the present invention relates to pesticidal compositions containing one or more plant essential oils and/or derivatives thereof to be used as a contact pesticide and repellent against human body louse. In a further aspect, the present invention relates to a method for controlling human body louse by the application of pesticidally effective amounts of the pesticidal compositions to a locus where pest control is desired.

BACKGROUND OF THE INVENTION

Pests (invertebrates, insects, arachnids, larvae thereof, etc.) are annoying to humans for a myriad of reasons. They have annually cost humans billions of dollars in crop losses and in the expense of keeping them under control. For example, the losses caused by pests in agricultural environments include decreased crop yield, reduced crop quality, and increased harvesting costs.

Over the years, synthetic chemical pesticides have provided an effective means of pest control. For example, one approach teaches the use of complex, organic insecticides, such as disclosed in U.S. Pat. Nos. 4,376,784 and 4,308,279. Other approaches employ absorbent organic polymers for widespread dehydration of the insects. *See*, U.S. Pat. Nos. 4,985,251; 4,983,390; 4,818,534; and 4,983,389. Use of inorganic salts as components of pesticides has also been tried, as disclosed in U.S. Pat. Nos. 2,423,284 and 4,948,013, European Patent Application No. 462 347, Chemical Abstracts 119(5):43357q (1993) and Farm Chemicals Handbook, page c102 (1987).

However, it has become increasingly apparent that the widespread use of synthetic chemical pesticides has caused detrimental environmental effects that are harmful to humans and other animals. For instance, the public has become concerned about the amount of residual

chemicals that persist in food, ground water and the environment, and that are toxic, carcinogenic or otherwise incompatible to humans, domestic animals and/or fish. Moreover, some target pests have even shown an ability to develop immunity to many commonly used synthetic chemical pesticides. In recent times, regulatory guidelines have encouraged a search for potentially less dangerous pesticidal compositions via stringent restrictions on the use of certain synthetic pesticides. As a result, elimination of effective pesticides from the market has limited economical and effective options for controlling pests. As an alternative, botanical pesticides are of great interest because they are natural pesticides, i.e.; toxicants derived from plants that are safe to humans and the environment.

The problem is even more evident with respect to the treatment of human body louse, where the treatment of children and other humans demand certain safety attributes. Each year over 10 million Americans get head lice (*pediculosis*) alone. Head lice are spread through direct contact or the sharing of certain household items and clothing. Many health professionals and parents are very concerned about the toxicity of pesticide shampoos, especially those containing Lindane. Furthermore, recent research indicates that head lice are becoming resistant to permethrin or pyrethrin shampoos, two current treatments for the problem.

Accordingly, there is a great need for novel and effective pesticidal compositions, containing no synthetic pyrethroids, chlorinated hydrocarbons, organophosphates, carbamates and the like, to be used against human body louse. In addition, there is a need for a method of treating the skin and hair, etc. of humans to kill and repel human body louse.

SUMMARY OF THE INVENTION

A primary object of the present invention is to provide novel pesticidal compositions for use against human body louse.

Another object of the invention is to provide novel pesticidal compositions containing one or more plant essential oils and/or derivatives thereof, natural or synthetic, as a contact pesticide in on-skin applications for the control of human body louse.

It is also an object of the present invention to provide a method of treating a locus where pest control is desired, such as clothes, bedding, sheets, pillows, etc.

It is also an object of the present invention to provide a pesticidal composition and method for mechanically and neurally controlling human body louse.

It is a further object to provide a safe, non-toxic pesticidal composition and method that will not harm mammals or the environment.

It is still another object to provide a pesticidal composition and method that has a pleasant scent or is unscented, and that can be applied without burdensome safety precautions.

It is still another object to provide a pesticidal composition and method as described above which can be inexpensively produced or employed.

It is yet another object of the invention to provide a pesticidal composition and method to which pests cannot build immunity.

It is yet another object of the present invention to provide a safe pesticidal composition that can be applied before detection of human body louse, as a repellent, such as everyday shampoos and body lotions.

The above and other objects are accomplished by the present invention which is directed to pesticidal compositions comprising at least one plant essential oil and/or a derivative thereof, natural or synthetic, in admixture with suitable carriers. In addition, the present invention is directed to a method for controlling human body louse by applying a pesticidally-effective amount of the above pesticidal compositions to a locus where pest control is desired.

Additional objects and attendant advantages of the present invention will be set forth, in part, in the description that follows, or may be learned from practicing or using the present invention. The objects and advantages may be realized and attained by means of the instrumentalities and combinations particularly recited in the appended claims. It is to be understood that the foregoing general description and the following detailed description are exemplary and explanatory only and are not to be viewed as being restrictive of the invention, as claimed.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

All patents, patent applications and literatures cited in this description are incorporated herein by reference in their entirety. In the case of inconsistencies, the present disclosure, including definitions, will prevail.

In one embodiment, the present invention provides a pesticidal composition comprising, in admixture with a suitable carrier and optionally with a suitable surface active agent, comprising one or more plant essential oil compounds and derivatives thereof, natural or synthetic, including racemic mixtures, enantiomers, diastereomers, hydrates, salts, solvates and metabolites, etc.

The plant essential oil or derivative thereof, may be comprised of a monocyclic, carbocyclic ring structure having six-members and is substituted by at least one oxygenated or hydroxyl functional moiety. Examples of plant essential oils encompassed within the present invention, include, but are not limited to, members selected from the group consisting of aldehyde C16 (pure), α-terpineol, amyl cinnamic aldehyde, amyl salicylate, anisic aldehyde, benzyl alcohol, benzyl acetate, cinnamaldehyde, cinnamic alcohol, carvacrol, carveol, citral, citronellal, citronellol, p-cymene, diethyl phthalate, dimethyl salicylate, dipropylene glycol, eucalyptol (cineole), eugenol, iso-eugenol, galaxolide, geraniol, guaiacol, ionone, menthol, methyl anthranilate, methyl ionone, methyl salicylate, α-phellandrene, pennyroyal oil, perillaldehyde, 1- or 2-phenyl ethyl alcohol, 1- or 2-phenyl ethyl propionate, piperonal, piperonyl acetate, piperonyl alcohol, D-pulegone, terpinen-4-ol, terpinyl acetate, 4-tert butylcyclohexyl acetate, thyme oil, thymol, metabolites of trans-anethole, vanillin, ethyl vanillin, and the like. The plant essential oils may also include known compounds such as pyrethrins, neem oil, d-limonene, and citronella oil. As these plant essential oil compounds are known and used for other uses, they may be prepared by a skilled artisan by employing known methods.

For example, in a preferred embodiment, the present invention is directed to a pesticidal composition for controlling human body louse comprising a mixture of plant essential oils which include benzyl alcohol and pyrethrins with a suitable solvent carrier. Data below shows that this embodiment is highly effective, i.e. exhibited contact mortality and repellency against body lice.

It will be appreciated by the skilled artisan that the pesticidal compositions of the present invention unexpectedly exhibit excellent pesticidal activities using one or more U.S. F.D.A. approved plant essential oils, in lieu of conventional synthetic pesticides which are not safe for use on humans and other sensitive areas. Without wishing to be bound by the following theories, it is believed that plant essential oils antagonize a pest's nerve receptors or may act as Phase I and/or Phase II drug metabolizing enzyme inhibitors. Alternatively, plant essential oils may act via an alternative mode of action. The plant essential oils may act as agonists or antagonists against the octopamine receptors that are distinct to invertebrates. In any event, the net effect of the toxicity and action of the inventive composition disclosed herein is heretofore unknown and unexpected.

Use of pesticidal compositions of the present invention generally results in 100% mortality on contact, along with good repellency and residual control. As such, they are advantageously employed as pesticidal agents in uses such as, without limitation, shampoos, hair gels, body crèmes, lotions, and other on-skin applications for the treatment of head lice, body lice, and pubic lice. They may also be used in combination with other pesticidally active compounds, to increase efficacy and/or reduce toxicity, generally making conventional pesticides more acceptable.

The term "carrier" as used herein means an inert or fluid material, which may be inorganic or organic and of synthetic or natural origin, with which the active compound is mixed or formulated to facilitate its application to the skin or hair or other object to be treated, or its storage, transport and/or handling. In general, any of the materials customarily employed in formulating pesticides, herbicides, or fungicides, are suitable. The inventive pesticidal compositions of the present invention may be employed alone or in the form of mixtures with such solid and/or liquid dispersible carrier vehicles and/or other known compatible active agents such as other pesticides, or pediculicides, acaricides, nematicides, fungicides, bactericides, rodenticides, herbicides, fertilizers, growth-regulating agents, etc., if desired, or in the form of particular dosage preparations for specific application made therefrom, such as solutions, emulsions, suspensions, powders, pastes, and granules which are thus ready for use. The pesticidal compositions of the present invention can be formulated or mixed with, if desired,

conventional inert pesticide diluents or extenders of the type usable in conventional pesticide formulations or compositions, e.g. conventional pesticide dispersible carrier vehicles such as gases, solutions, emulsions, suspensions, emulsifiable concentrates, spray powders, pastes, soluble powders, dusting agents, granules, foams, pastes, tablets, aerosols, natural and synthetic materials impregnated with active compounds, microcapsules, and formulations used with burning equipment, such as fumigating cartridges, fumigating cans and fumigating coils, as well as ULV cold mist and warm mist formulations, etc.

Formulations containing the pesticidal compositions of the present invention may be prepared in any known manner, for instance by extending the pesticidal compositions with conventional pesticide dispersible liquid diluent carriers and/or dispersible solid carriers optionally with the use of carrier vehicle assistants, e.g. conventional pesticide surface-active agents, including emulsifying agents and/or dispersing agents, whereby, for example, in the case where water is used as diluent, organic solvents may be added as auxiliary solvents. Suitable liquid diluents or carriers include water, petroleum distillates, or other liquid carriers with or without surface active agents. The choice of dispersing and emulsifying agents and the amount employed is dictated by the nature of the composition and the ability of the agent to facilitate the dispersion of the pesticidal compositions of the present invention. Non-ionic, anionic, amphoteric, or cationic dispersing and emulsifying agents may be employed, for example, the condensation products of alkylene oxides with phenol and organic acids, alkyl aryl sulfonates, complex ether alcohols, quaternary ammonium compounds, and the like.

Liquid concentrates may be prepared by dissolving a composition of the present invention with a solvent and dispersing the pesticidal compositions of the present inventions in water with the acid of suitable surface active emulsifying and dispersing agents. Examples of conventional carrier vehicles for this purpose include, but are not limited to, aerosol propellants which are gaseous at normal temperatures and pressures, such as Freon; inert dispersible liquid diluent carriers, including inert organic solvents, such as aromatic hydrocarbons (e.g. benzene, toluene, xylene, alkyl naphthalenes, etc.), halogenated especially chlorinated, aromatic hydrocarbons (e.g. chloro-benzenes, etc.), cycloalkanes, (e.g. cyclohexane, etc.). paraffins (e.g. petroleum or mineral oil fractions), chlorinated aliphatic hydrocarbons (e.g. methylene chloride,

chloroethylenes, etc.), alcohols (e.g. methanol, ethanol, propanol, butanol, glycol, etc.) as well as ethers and esters thereof (e.g. glycol monomethyl ether, etc.), amines (e.g. ethanolamine, etc.), amides (e.g. dimethyl formamide etc.) sulfoxides (e.g. dimethyl sulfoxide, etc.), acetonitrile, ketones (e.g. acetone, methyl ethyl ketone, methyl isobutyl ketone, cyclohexanone, etc.), and/or water; as well as inert dispersible finely divided solid carriers such as ground natural minerals (e.g. kaolins, clays, vermiculite, alumina, silica, chalk, i.e. calcium carbonate, talc, attapulgite, montmorillonite, kieselguhr, etc.) and ground synthetic minerals (e.g. highly dispersed silicic acid, silicates, e.g. alkali silicates, etc.).

Surface-active agents, i.e., conventional carrier vehicle assistants, that may be employed with the present invention include, without limitation, emulsifying agents, such as non-ionic and/or anionic emulsifying agents (e.g. polyethylene oxide esters of fatty acids, polyethylene oxide ethers of fatty alcohols, alkyl sulfates, alkyl sulfonates, aryl sulfonates, albumin hydrolyzates, etc. and especially alkyl arylpolyglycol ethers, magnesium stearate, sodium oleate, etc.); and/or dispersing agents such as lignin, sulfite waste liquors, methyl cellulose, etc.

In the preparation of wettable powders, dust or granulated formulations, the active ingredient is dispersed in and on an appropriately divided carrier. In the formulation of the wettable powders the aforementioned dispersing agents as well as lignosulfonates can be included. Dusts are admixtures of the compositions with finely divided solids such as talc, attapulgite clay, kieselguhr, pyrophyllite, chalk, diatomaceous earth, vermiculite, calcium phosphates, calcium and magnesium carbonates, sulfur, flours, and other organic and inorganic solids which acts carriers for the pesticide. These finely divided solids preferably have an average particle size of less than about 50 microns. A typical dust formulation useful for controlling pests contains 1 part of pesticidal composition and 99 parts of diatomaceous earth or vermiculite. Granules may comprise porous or nonporous particles. The granule particles are relatively large, a diameter of about 400-2500 microns typically. The particles are either impregnated or coated with the inventive pesticidal compositions from solution. Granules generally contain 0.05-15%, preferably 0.5-5%, active ingredient as the pesticidally-effective amount. Thus, the contemplated are formulations with solid carriers or diluents such as bentonite, fullers earth, ground natural minerals, such as kaolins, clays, talc, chalk, quartz,

attapulgite, montmorillonite or diatomaceous earth, vermiculite, and ground synthetic minerals, such as highly-dispersed silicic acid, alumina and silicates, crushed and fractionated natural rocks such as calcite, marble, pumice, sepiolite and dolomite, as well as synthetic granules of inorganic and organic meals, and granules of organic materials such as sawdust, coconut shells, corn cobs and tobacco stalks. Adhesives, such as carboxymethyl cellulose, natural and synthetic polymers, (such as gum arabic, polyvinyl alcohol and polyvinyl acetate), and the like, may also be used in the formulations in the form of powders, granules or emulsifiable concentrations.

If desired, colorants such as inorganic pigments, for example, iron oxide, titanium oxide and Prussian Blue, and organic dyestuffs, such as alizarin dyestuffs, azo dyestuffs or metal phthalocyanine dyestuffs, and trace elements, such as salts of iron, manganese, boron, copper, cobalt, molybdenum and zinc may be used.

In commercial applications, the present invention encompasses carrier composition mixtures in which the pesticidal compositions are present in an amount substantially between about 0.01-95% by weight, and preferably 0.5-90% by weight, of the mixture, whereas carrier composition mixtures suitable for direct application or field application generally contemplate those in which the active compound is present in an amount substantially between about 0.0001-10%, preferably 0.01-1%, by weight of the mixture. Thus, the present invention contemplates over-all formulations that comprise mixtures of a conventional dispersible carrier vehicle such as (1) a dispersible inert finely divided carrier solid, and/or (2) a dispersible carrier liquid such as an inert organic solvent and/or water, preferably including a surface-active effective amount of a carrier vehicle assistant, e.g. a surface-active agent, such as an emulsifying agent and/or a dispersing agent, and an amount of the active compound which is effective for the purpose in question and which is generally between about 0.0001-95%, and preferably 0.01-95%, by weight of the mixture.

Furthermore, the present invention encompasses methods for killing, combating or controlling pests, which comprises applying to at least one of correspondingly (a) such pests and (b) the corresponding habitat thereof, i.e. the locus to be protected, e.g. to the head or body, a correspondingly combative, a pesticidally effective amount, or toxic amount of the particular pesticidal compositions of the invention alone or together with a carrier as noted above. The

instant formulations or compositions may be applied in any suitable usual manner, for instance by shampooing, rubbing, spreading, spraying, atomizing, vaporizing, scattering, dusting, watering, squirting, sprinkling, pouring, fumigating, and the like. The method for controlling human body louse comprises applying the inventive composition, ordinarily in a formulation of one of the aforementioned types, to a locus or area to be protected from the human body louse, such as the hair or scalp. The compound, of course, is applied in an amount sufficient to effect the desired action. This dosage is dependent upon many factors, including the targeted pest, the carrier employed, the method and conditions of the application, whether the formulation is present at the locus in the form of a shampoo, hair gel, crème, or body lotion, an aerosol, or as a film, or as discrete particles, the thickness of film or size of particles, and the like. Proper consideration and resolution of these factors to provide the necessary dosage of the active compound at the locus to be protected are within the skill of those versed in the art. In general, however, the effective dosage of the compound of this invention at the locus to be protected-i.e., the dosage with which the pest comes in contact-is of the order of 0.001 to 5.0% based on the total weight of the formulation, though under some circumstances the effective concentration will be as little as 0.0001% or as much as 20%, on the same basis.

The pesticidal compositions and methods of the present invention are effective against different species of human body louse, including head lice, body lice and pubic lice, and it will be understood that the body lice exemplified and evaluated in the working Examples herein is representative of such a wider variety.

The composition and method of the present invention will be further illustrated in the following, non-limiting Examples. The Examples are illustrative of various embodiments only and do not limit the claimed invention regarding the materials, conditions, weight ratios, process parameters and the like recited herein.

EXAMPLE 1

Pesticidal Effects of Plant Essential Oils against the Human Body Louse

Certain plant essential oils and mixtures thereof were evaluated for contact toxicity (topical and walk-across) and repellency against body lice. Body lice are the test model insect for all human body louse testing, and are a necessary step in the proper evaluation of new products. The plant essential oils and blends thereof were dissolved in a test solvent and applied to various surfaces. Body lice were then added to the surface and monitored for mortality and repellency or avoidance of the treated surface.

The following pesticial compositions were prepared and tested as follows:

A- ADL 1-98-1 Benzyl Alcohol (lot#51791): Pyrethrum Extract (20% pyrethrins) (lot #E100899058); 40 parts of benzyl alcohol to 1 part pyrethrin

B- ADL 1-98-2 EcoSMART Blend S1080 (no lot #)

C- ADL 1-98-3 EcoSMART 4-Blend lot #57455: equal parts of benzyl alcohol, phenethyl alcohol, phenethyl propionate, and α-terpineol

D- ADL 1-98-4 EcoSMART 5-Blend (lot #61013): 40% thymol, 25% trans-anethole, 15% α-terpineol, 10% eugenol, and 10% citronellal

E- ADL 1-98-5 Peppermint Oil (L2624)

F- ADL 1-98-6 Rosemary Oil (P2570)

G- ADL 1-98-7 Benzyl Alcohol (lot #51791): Eugenol (lot #F57215); 8 parts benzyl alcohol to 1 part eugenol

H- ADL 1-98-8 Benzyl Alcohol (lot #51791): Eugenol (lot #F57215); 1 part benzyl alcohol to 2 parts eugenol

I- ADL 1-98-9 Eugenol (lot #F57215)

The test results were as follows:

A- Very Good Kill and Repellency
B- Good Repellency
C- Good Repellency
D- Good Repellency with Residual Control
E- Effective, but less than A-D
F- Effective, but less than A-D
G- Effective, but less than A-D
H- Effective, but less than A-D
I- Effective, but less than A-D

These data clearly demonstrate that plant essential oils may be used as a safe and effective alternative pesticide for control of human body louse. The plant essential oils demonstrated mortality and repellency, over extended periods of time, which provided good control. The data also demonstrate the synergistic action of the blends over individual plant essential oils.

As can be seen from the above discussion, the pesticidal combinations of active compounds according to the present invention are markedly superior to known pesticidal agents/active compounds conventionally used for control of human body louse.

Although illustrative embodiments of the invention have been described in detail, it is to be understood that the present invention is not limited to those precise embodiments, and that various changes and modifications can be effected therein by one skilled in the art without departing from the scope and spirit of the invention as defined by the appended claims.

WHAT IS CLAIMED IS:

1. A contact pesticidal composition for the control of human body louse comprising, in admixture with an acceptable carrier, at least one plant essential oil compound or derivative thereof.

2. The pesticidal composition of claim 1, wherein the plant essential oil or derivative thereof, comprises a monocyclic, carbocyclic ring structure having six-members and substituted by at least one oxygenated or hydroxyl functional moiety.

3. The pesticidal composition of claim 1, wherein the plant essential oil compounds or derivatives thereof are selected from the group consisting of aldehyde C16 (pure), α-terpineol, amyl cinnamic aldehyde, amyl salicylate, anisic aldehyde, benzyl alcohol, benzyl acetate, cinnamaldehyde, cinnamic alcohol, carvacrol, carveol, citral, citronellal, citronellol, p-cymene, diethyl phthalate, dimethyl salicylate, dipropylene glycol, eucalyptol (cineole) eugenol, iso-eugenol, galaxolide, geraniol, guaiacol, ionone, menthol, methyl anthranilate, methyl ionone, methyl salicylate, α-phellandrene, pennyroyal oil, perillaldehyde, 1- or 2-phenyl ethyl alcohol, 1- or 2-phenyl ethyl propionate, piperonal, piperonyl acetate, piperonyl alcohol, D-pulegone, terpinen-4-ol, terpinyl acetate, 4-tert butylcyclohexyl acetate, thyme oil, thymol, metabolites of trans-anethole, vanillin, and ethyl vanillin.

4. The pesticidal composition of claim1, wherein the plant essential oil comprises pyrethrins, neem oil, d-limonene and/or citronella oil.

5. A repellent pesticidal composition for the control of human body louse in shampoos, hair gels, body crèmes, lotions and other on skin applications comprising, in admixture with an acceptable carrier, at least one plant essential oil compound or derivative thereof.

6. The pesticidal composition of claim 5, wherein the plant essential oil or derivative thereof, comprises a monocyclic, carbocyclic ring structure having six-members and substituted by at least one oxygenated or hydroxyl functional moiety.

7. The pesticidal composition of claim 5, wherein the plant essential oil compounds or derivatives thereof are selected from the group consisting of aldehyde C16 (pure), α-terpineol, amyl cinnamic aldehyde, amyl salicylate, anisic aldehyde, benzyl alcohol, benzyl acetate,

cinnamaldehyde, cinnamic alcohol, carvacrol, carveol, citral, citronellal, citronellol, p-cymene, diethyl phthalate, dimethyl salicylate, dipropylene glycol, eucalyptol (cineole) eugenol, iso-eugenol, galaxolide, geraniol, guaiacol, ionone, menthol, methyl anthranilate, methyl ionone, methyl salicylate, α-phellandrene, pennyroyal oil perillaldehyde, 1- or 2-phenyl ethyl alcohol, 1- or 2-phenyl ethyl propionate, piperonal, piperonyl acetate, piperonyl alcohol, D-pulegone, terpinen-4-ol, terpinyl acetate, 4-tert butylcyclohexyl acetate, thyme oil, thymol, metabolites of trans-anethole, vanillin, and ethyl vanillin.

8. The pesticidal composition of claim 5, wherein the plant essential oil comprises pyrethrins, neem oil, d-limonene and/or citronella oil.

9. A method for controlling human body louse, which comprises applying to the locus where control is desired a pesticidally-effective amount of the composition of claim 1.

10. A contact and repellent pesticidal composition for the control of human body louse comprising, in admixture with an acceptable carrier, at least one plant essential oil compound or derivative thereof and one or more conventional pesticides.

11. The pesticidal composition of claim 10, wherein the plant essential oil or derivative thereof, comprises a monocyclic, carbocyclic ring structure having six-members and substituted by at least one oxygenated or hydroxyl functional moiety.

12. The pesticidal composition of claim 10, wherein the plant essential oil compounds or derivatives thereof are selected from the group consisting of aldehyde C16 (pure), α-terpineol, amyl cinnamic aldehyde, amyl salicylate, anisic aldehyde, benzyl alcohol, benzyl acetate, cinnamaldehyde, cinnamic alcohol, carvacrol, carveol, citral, citronellal, citronellol, p-cymene, diethyl phthalate, dimethyl salicylate, dipropylene glycol, eucalyptol (cineole) eugenol, iso-eugenol, galaxolide, geraniol, guaiacol, ionone, menthol, methyl anthranilate, methyl ionone, methyl salicylate, α-phellandrene, pennyroyal oil perillaldehyde, 1- or 2-phenyl ethyl alcohol, 1- or 2-phenyl ethyl propionate, piperonal, piperonyl acetate, piperonyl alcohol, D-pulegone, terpinen-4-ol, terpinyl acetate, 4-tert butylcyclohexyl acetate, thyme oil, thymol, metabolites of trans-anethole, vanillin, and ethyl vanillin.

13. The pesticidal composition of claim 10, wherein the conventional pesticide is pyrethrin, synthetic pyrethroids, organophosphates, and carbamates.

INTERNATIONAL SEARCH REPORT

International Application No
PCT/GB 03/00061

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 A61K35/78 A61P33/14

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 A61K A61P

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
WPI Data, EPO-Internal, PAJ, PASCAL, EMBASE, MEDLINE, BIOSIS

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 01 60163 A (BESSETTE STEVEN M ;ECOSMART TECHNOLOGIES INC (US)) 23 August 2001 (2001-08-23) page 4, line 11 - line 25 page 7, line 9 - line 14 claims 1,5,7,8	1,2,7,10
Y		8,9

X	GB 2 341 091 A (ORE AN LTD) 8 March 2000 (2000-03-08)	1,2,10
Y	page 7-8	8,9

X	WO 91 05561 A (HULL PETER HUGH) 2 May 1991 (1991-05-02) claims 1,6,7	1,6,7,10

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[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

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Date of the actual completion of the international search	Date of mailing of the international search report
2 May 2003	09/05/2003

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Thalmair, M

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